

**REMARKS**

Claims 1-19 are all the claims pending in the application.

**Allowable Subject Matter**

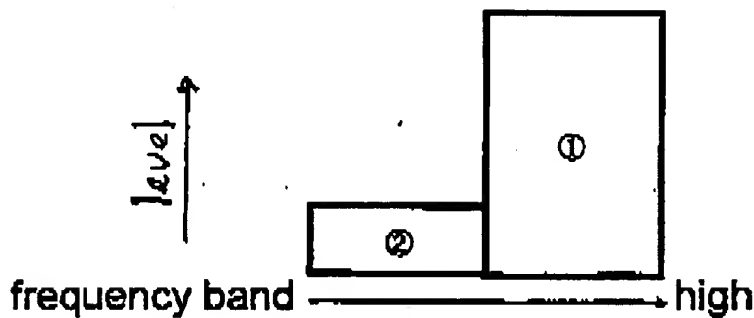
Applicant thanks the Examiner for indicating that claims 11, 13, 16 and 18 are allowed.

**Claim Rejections - 35 U.S.C. § 103**

Claims 1-10, 12, 14, 15, 17 and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Miller et al. (U.S. Patent No. 5,506,910) in view of Koyama et al. (U.S. Patent No. 5,581,621). Applicant respectfully traverses.

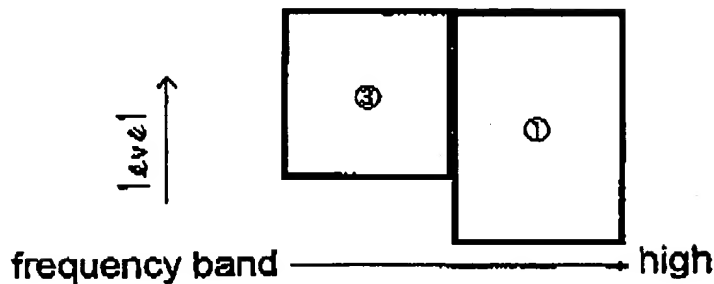
Claim 1 sets forth first sound generating means and a second sound generating means. The first sound generating means reproduce sound in first and second frequency bands, and the second sound generating means reproduces sound in the second frequency band. Claim 1 also sets forth that phase characteristic correction is performed on the sound generating means and then the levels of the audio signals are adjusted. Claim 1 is allowable over the combined teachings and suggestions of Miller and Koyama because the references fail to teach the phase characteristic correction followed by level adjustment as claimed.

Miller outputs in the entire frequency bands from the same loudspeaker. The respective frequency bands output from the loudspeakers are detected and their levels are independently adjusted. For example, in the graph shown below, (1) is the level of the middle/high frequency band in the loudspeaker and (2) is the level of the low frequency band.



In Miller, although there are multiple loudspeakers, adjustment is performed for each of the loudspeakers individually (*see*, for example, column 7, lines 38-41). The effect that the loudspeakers have on one another is not considered in Miller and there is no phase characteristic correction before level adjustment as claimed. Accordingly, Miller does not disclose the features of claim 1.

Koyama also does not consider the cumulative effects of the speakers and does not correct the deficiencies of Miller with respect to claim 1. In Koyama, a first loudspeaker reproduces in the middle/high frequency band and a second loudspeaker reproduces sound in the low frequency band. Because the loudspeakers do not have frequency bands which overlap with one another, the adjustment of the loudspeaker levels is done independently of one another. That is, the low frequency band loudspeaker does not reproduce sound in the middle/high frequency band and the middle/high frequency loudspeaker does not reproduce sound in the low frequency band. For example, the graph below indicates an output from the speakers in Koyama where (1) is the level of the middle/high frequency band which is produced by a middle/high level frequency band loudspeaker and (2) is the level of a low frequency band reproduced by a low frequency band loudspeaker.



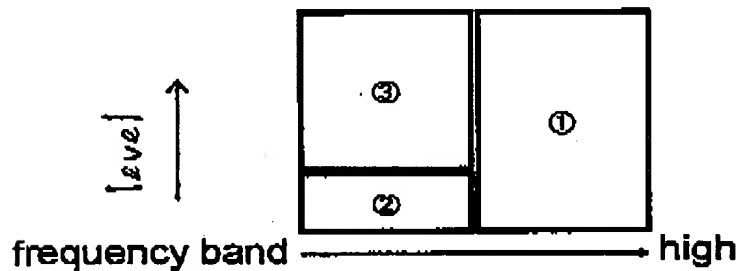
Since the loudspeakers do not reproduce sounds in the same frequency bands, the sound output of one type of loudspeaker does not have an effect on the sound reproduction produced by the other. Accordingly, independent adjustment is performed in Koyama.

As stated above, claim 1 sets forth a plurality of first sound generating means which reproduce sound in a first and a second frequency band and a second sound generating means which reproduces sound in the second frequency band. Both the first sound generating means and the second sound generating means reproduce sound in the second frequency band.

Accordingly, the sound generating means have an effect on one another.

In a non-limiting embodiment consistent with the claimed invention, there may be a speaker which reproduces sound in the middle/high frequency and in the low frequency and another speaker which reproduces sound in only the low-frequency band (*see*, for example, the first full paragraph of page 9 of the specification). For example, the graph below illustrates (1) the level of the middle/high frequency band in an all frequency band speaker, (2) the level of the low frequency band in the all frequency band speaker and (3) the level of the low frequency band in the low frequency band loudspeaker. Although the described non-limiting embodiment includes a low frequency band and a high frequency band, the claimed invention is not limited to

the first frequency band and the second frequency band being defined as a low frequency band and a high frequency band.



The low frequency band is outputted from each of the all frequency loudspeaker and the low frequency band exclusively reproducing loudspeaker. Although it is adjusted so that the level of the output (2)+(3) corresponds to the level of the output (1),  $(1)=(2)+(3)$  is not simply satisfied.

In case of the adjustment of the level in one loudspeaker, it is possible to perform electrical processes. For example, in Miller, if the level of the output (1) is 95dB and the level of the output (2) is 90dB, it is possible to adjust the levels of the outputs (1) and (2) by raising the voltage of the difference thereof 5dB. Consider when a microphone is located at the position of the listener, signals having a frequency characteristics  $A(f)$  are simultaneously inputted to the all frequency loudspeaker and the low frequency band loudspeaker.

When, the transmission characteristics from the all frequency band loudspeaker to the microphone is  $H_a(f)$ , and the transmission characteristics from the low frequency band loudspeaker to the microphone is  $H_l(f)$ , the frequency characteristics of the signal obtained by the microphone is  $H_m(f)=A(f)*(H_a(f)+H_l(f))$ .

Consider observing a time signal by inputting a single sine wave (frequency  $f_0$ ) Then, it is sufficient to consider the transmission system as only  $f_0$  and:

$$A(f): \sin(2\pi \cdot f_0 \cdot t)$$

$$H_a(f): \text{amplitude } a \text{ times, time delay } t_a$$

$$H_l(f); \text{amplitude } l \text{ times, time delay } t_b$$

In this condition, the time signal of  $H_m(t)$  is as follows:  $H_m(t) = a \cdot \sin(2\pi \cdot f_0 \cdot (t - t_a)) + l \cdot \sin(2\pi \cdot f_0 \cdot (t - t_b))$ . The signal has two sine waves which are shifted in time and create an amplitude overlap.

If the levels at the microphone of the outputs (1) to (3) are independently obtained, the matter is to obtain a proper reproducing level of the output (3). Since the level of (2)+(3) is determined by the level of (1), a target level (1') of  $H_m(t)$  is obtained by (1). Further, since (2) is also obtained, the level (2') of  $a \cdot \sin(2\pi \cdot f_0 \cdot (t - t_a))$  is obtained. However, since a time shift between  $t_a$  and  $t_b$  is unknown, it is impossible to obtain a proper  $l$  from (1') and (2').

Although (1)=(2)+(3) is not simply satisfied, performing audio level correction after a phase characteristics correction, as in the claimed invention, aids in properly adjusting the audio levels. Performing phase characteristics correction may make  $t_a = t_b$  in the above formula.

In this condition, the timing of the both sine waves overlap, and it is represented by the formula as follows.

$$H_m(t) = a \cdot \sin(2\pi \cdot f_0 \cdot (t - t_a)) + l \cdot \sin(2\pi \cdot f_0 \cdot (t - t_b)) = (a+l) \cdot \sin(2\pi \cdot f_0 \cdot (t - t_a))$$

Then,  $(a+l)$  is obtained by (1'), and then,  $a$  is obtained by (2').

In this time,  $l$  is easily assumable from  $(a+l)-a$ .

Neither Miller nor Koyama considers that the output from one loudspeaker has an effect to the other loudspeakers when there are plural of loudspeakers which output to the same frequency band. Additionally, they do not teach phase characteristic correction followed by level adjustment as set forth in claim 1. Accordingly, claim 1 is allowable over the combined teachings and suggestions of Miller and Koyama.

Independent claims 2, 5, 6, 10 and 15 are allowable for reasons similar to those cited above for the allowability of claim 1. Therefore Applicant respectfully requests that the Examiner withdraw the rejection of claims 2, 5, 6, 10 and 15.

Further claims 3, 4, 7-9, 12, 14, 17 and 19 depend from various ones of claims 1, 2, 5, 6, 10 and 15. Therefore, claims 3, 4, 7-9, 12, 14, 17 and 19 are allowable at least because of their dependency.

### **Conclusion**

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. § 1.111  
U.S. Application No. 09/781,273

Q62912

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

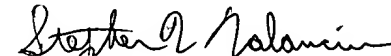
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